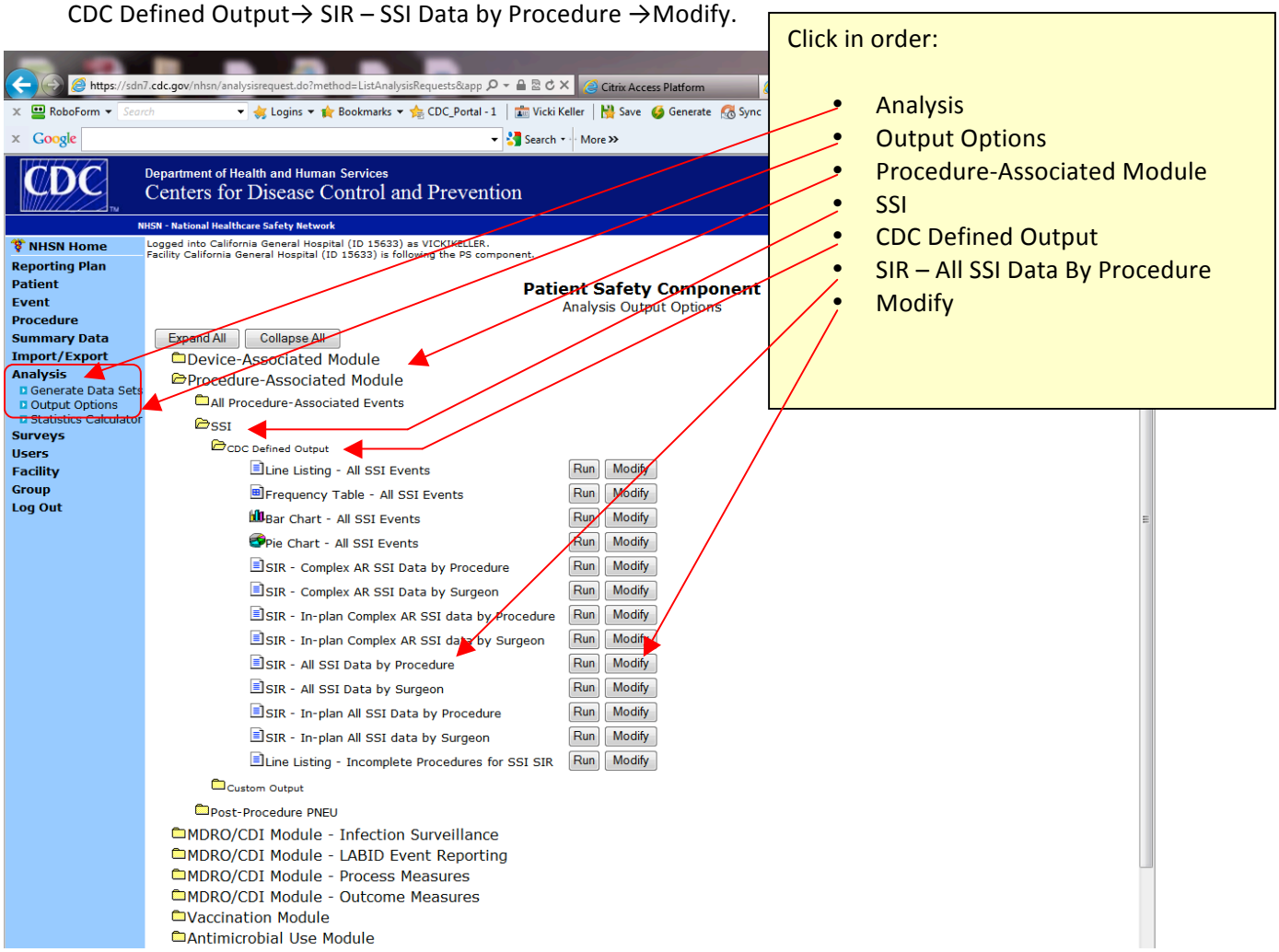
Using NHSN Analysis to Review and Understand SSI Data

Using the NHSN Analysis features allows you to easily view and work with your SSI surveillance data. You can verify that all procedures and events have been entered each month, and can analyze SSI findings using the standardized infection ratio (SIR). In this document, we will demonstrate how to run reports to calculate SIR by procedure, by procedure and surgeon, and how to compare SIRs using the Statistics Calculator. We will also demonstrate how to enter surgeon codes manually or upload a list of surgeon codes by creating a csv file.

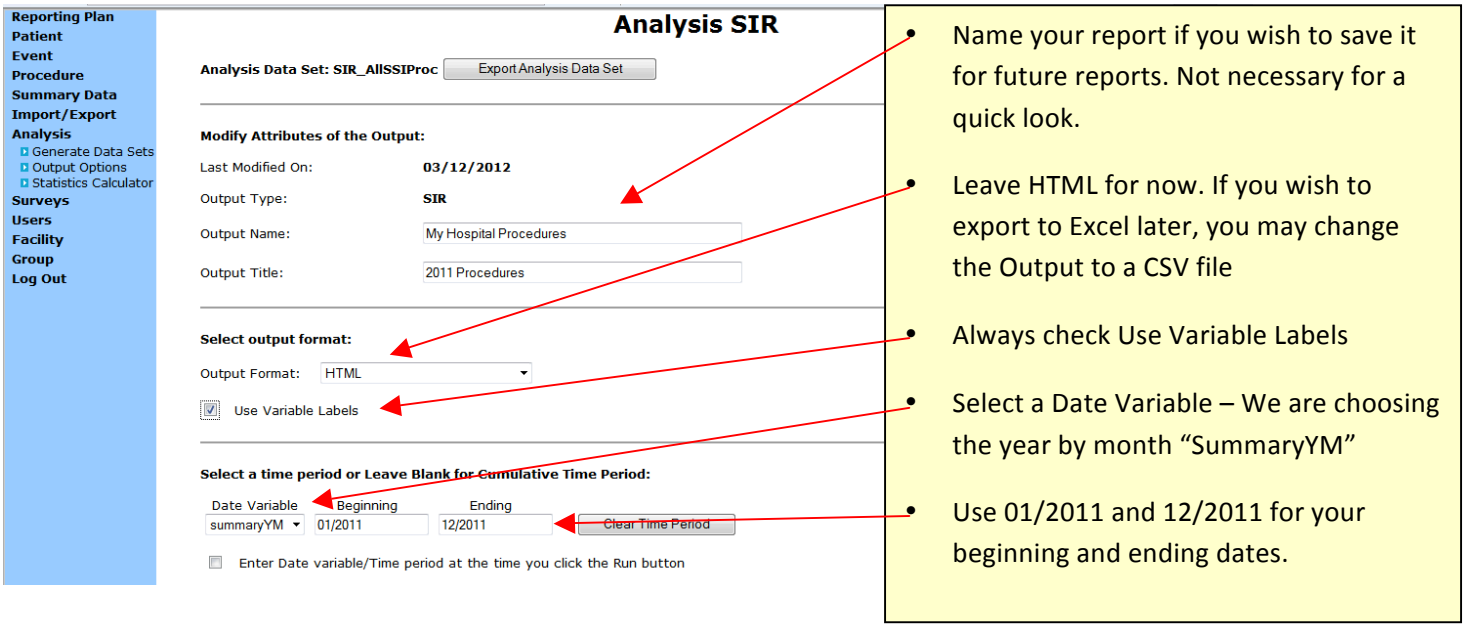
Using the SIR Output Option to Review SSI Data by Procedure Type

Always begin by generating a data set prior to using the Analysis features to be sure all data are current.

1. In the NHSN Portal click Analysis →Output Options→ Procedure-Associated Module→ SSI→ CDC Defined Output→ SIR – SSI Data by Procedure →Modify.



2. After clicking “Modify”, the “Analysis SIR” screen appears. Make changes depending on what you want in your report.
   - Give your Output a name if you wish.
   - Select output format. HTML looks nice in your report. A CSV file is the best if you’re going to export to an Excel spreadsheet.
   - Use Variable Labels. Column headers are easier to read.
   - Choose your date range. When checking completeness of monthly data, “SummaryYM” is best. Be sure “Group by” (towards the bottom left of the page) also has “summary YM” selected.
   - Click “Run” to see the data right now. We will discuss the export option later.



- Name your report if you wish to save it for future reports. Not necessary for a quick look.
- Leave HTML for now. If you wish to export to Excel later, you may change the Output to a CSV file
- Always check Use Variable Labels
- Select a Date Variable – We are choosing the year by month “SummaryYM”
- Use 01/2011 and 12/2011 for your beginning and ending dates.

Be sure “SummaryYM” is visible in the “Group By” drop down box at the bottom of the screen – then click “Run.

You should see a screen with several tables as demonstrated in the example on the following page.

3. The first table shows every month procedures were reported in 2011 and the total number of reported procedures each month.

National Healthcare Safety Network
2011 Procedures - By OrgID
As of: March 25, 2012 at 6:24 PM
Date Range: SIR_ALLSSIPROC summaryYM 2011M01 to 2011M12

Note: These are fictional procedures in our test hospital for demonstration purposes only; not every month is represented.

When observing your own data, a missing month may be an error if any surgeries in the required 29 reportable procedure categories were performed.

All Procedures Performed in 2011, reported by month

Org ID	Summary Yr/Mon	Procedure Count	All SSI Model Infection Count	All SSI Model Number Expected	All SSI Model SIR	All SSI Model SIR p-value	All SSI Model 95% Confidence Interval
15633	2011M01	40	1	1.126	0.888	0.6895	0.022, 4.948
15633	2011M02	31	5	1.588	3.149	0.0230	1.022, 7.348
15633	2011M05	5	2	0.054	.	.	
15633	2011M08	4	1	0.183	.	.	
15633	2011M09	1	0	0.007	.	.	
15633	2011M11	2	0	0.018	.	.	
15633	2011M12	2	0	0.028	.	.	

4. The next table provides a summary of your data (white columns) and your data compared to NHSN data (yellow columns). Listed are each procedure category you reported by month (listed alphabetically), the number of procedures reported each month, and the SSI you reported each month (by procedure type).

Procedures listed alphabetically; reported by month

Shown also (yellow) is the number of SSI expected each month based on NHSN risk models, the SIR each month, SIR p-value, and 95% confidence interval. Most hospitals will need to review SSI data by quarter, half-year, or year to calculate SIRs. We are going to look more closely at this section later in the lesson.

Org ID	Procedure Code	Summary Yr/Mon	Procedure Count	All SSI Model Infection Count	All SSI Model Number Expected	All SSI Model SIR	All SSI Model SIR p-value	All SSI Model 95% Confidence Interval
15633	AAA	2011M08	1	0	0.048	.	.	
15633	CARD	2011M08	1	0	0.029	.	.	
15633	CBGB	2011M01	6	0	0.088	.	.	
15633	CBGB	2011M02	1	1	0.044	.	.	
15633	CBGB	2011M08	1	0	0.008	.	.	
15633	CBGC	2011M01	10	0	0.178	.	.	
15633	COLO	2011M02	30	4	1.545	2.589	0.0714	0.705, 6.629
15633	CSEC	2011M01	2	1	0.026	.	.	
15633	CSEC	2011M05	1	0	0.013	.	.	
15633	CSEC	2011M11	2	0	0.018	.	.	
15633	CSEC	2011M12	2	0	0.028	.	.	
15633	FUSN	2011M05	2	2	0.010	.	.	
15633	HPRO	2011M01	22	0	0.834	.	.	
15633	HPRO	2011M05	1	0	0.008			
15633	HPRO	2011M09	1					
15633	LTP	2011M08	1					
15633	SPLE	2011M05	1					

Remember, SIR is never calculated if the number of expected SSI expected is less than 1 (you cannot have <1 person infected). Your hospital may not have enough procedures to calculate an SIR for every procedure.

5. The third table stratifies your procedure data by whether performed in an outpatient or inpatient setting. Procedures you reported as being performed in an Outpatient setting will be indicated by "Y." Inpatient procedures will be indicated as "N." This is also a good way to check if any procedures were inadvertently entered as outpatient. (For those hospitals monitoring both in- and outpatient procedures, later we will demonstrate how to limit your report to only inpatient procedures).

   In our example below, note the HPRO listed as an outpatient procedure. We know that no HPROs are being done as outpatients in our hospital (yet!) The data can be corrected by finding and modifying the procedure record from January 2011.

Org ID=15633

Org ID	Procedure Code	Performed in Outpatient Setting?	Summary Yr/Mon	Procedure Count	All SSI Model Infection Count	All SSI Model Number Expected	All SSI Model SIR	All SSI Model SIR p-value	All SSI Model 95% Confidence Interval
15633	AAA	N	2011M08	1	0	0.048	.	.	
15633	CARD	N	2011M08	1	0	0.029	.	.	
15633	CBGB	N	2011M01	6	0	0.088	.	.	
15633	CBGB	N	2011M02	1	1	0.044	.	.	
15633	CBGB	N	2011M08	1	0	0.008	.	.	
15633	CBGC	N	2011M01	10	0	0.178	.	.	
15633	COLO	N	2011M02	30	4	1.545	2.589	0.0714	0.705, 6.629
15633	CSEC	N	2011M01	2	1	0.026	.	.	
15633	CSEC	N	2011M05	1	0	0.013	.	.	
15633	CSEC	N	2011M11	2	0	0.018	.	.	
15633	CSEC	N	2011M12	2	0	0.028	.	.	
15633	FUSN	N	2011M05	2	2	0.010	.	.	
15633	HPRO	N	2011M01	21	0	0.826	.	.	
15633	HPRO	N	2011M05	1	0	0.008	.	.	
15633	HPRO	N	2011M09	1	0	0.007	.	.	
15633	HPRO	Y	2011M01	1	0	0.008	.	.	
15633	LTP	N	2011M08	1	1	0.098	.	.	
15633	SPLE	N	2011M05	1	0	0.023	.	.	

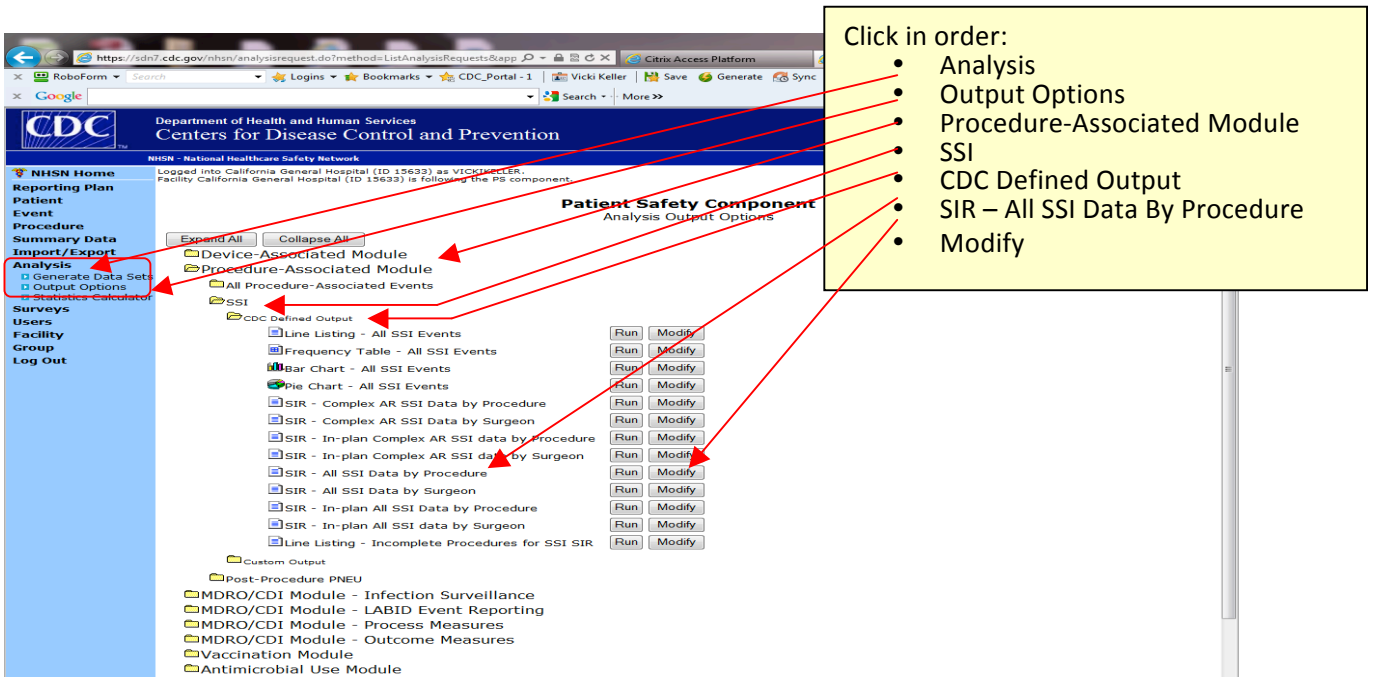
6. The last table lists "Procedures not included SIR". These procedures have been excluded from your SIR calculations. The data may be incomplete, or one of the data fields is identified as being an an outlier, such as an extremely long surgical duration. Take a look at each case individually to determine where the possible errors are.

National Healthcare Safety Network
Incomplete and Custom Procedures not Included in SIR
As of: March 25, 2012 at 6:24 PM
Date Range: SIR_ALLSSIPROC summaryYM 2011M01 to 2011M12

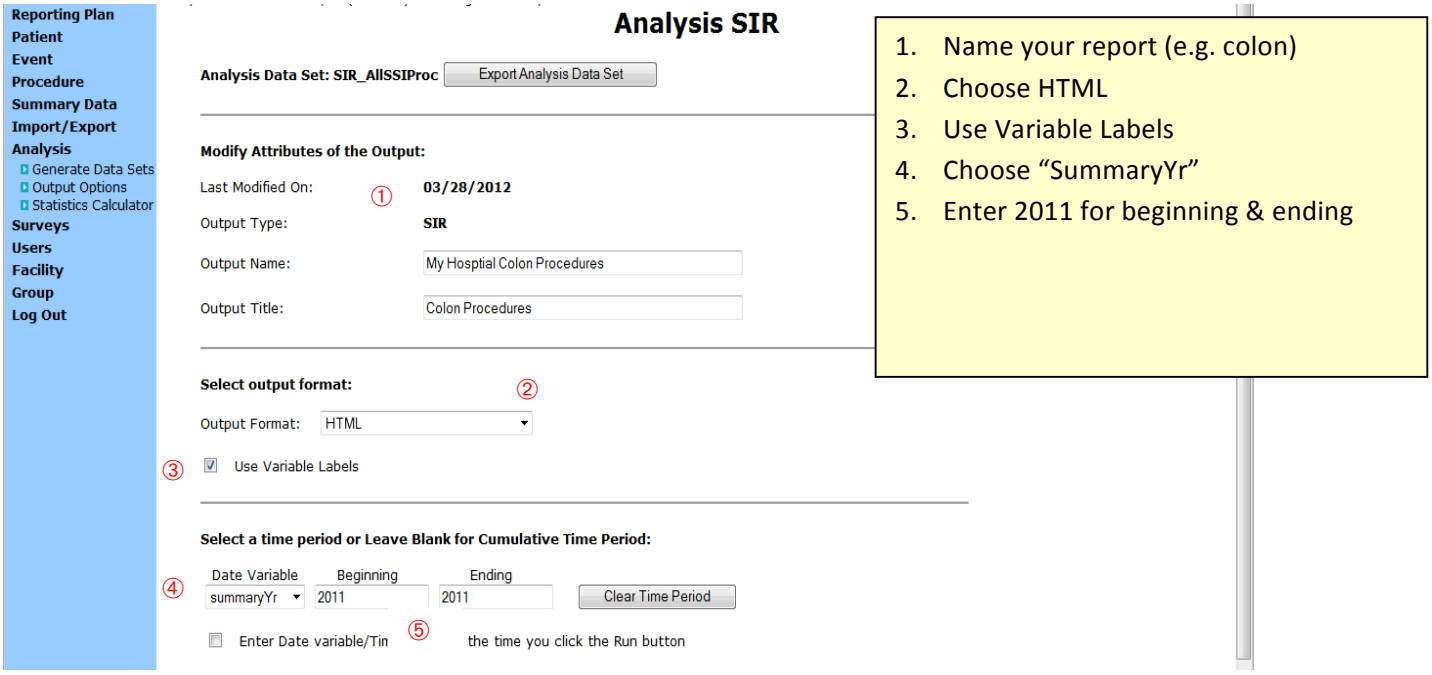
Org ID=15633

Summary Yr/Mon	Org ID	Procedure Code	Performed in Outpatient Setting?	Procedure Count	All SSI Model Infection Count
2011M12	15633	APPY	N	1	1
2011M01	15633	CBGC	N	1	0
2011M05	15633	FUSN	N	1	0
2011M06	15633	KPRO	Y	1	0
2011M09	15633	KPRO	N	1	0

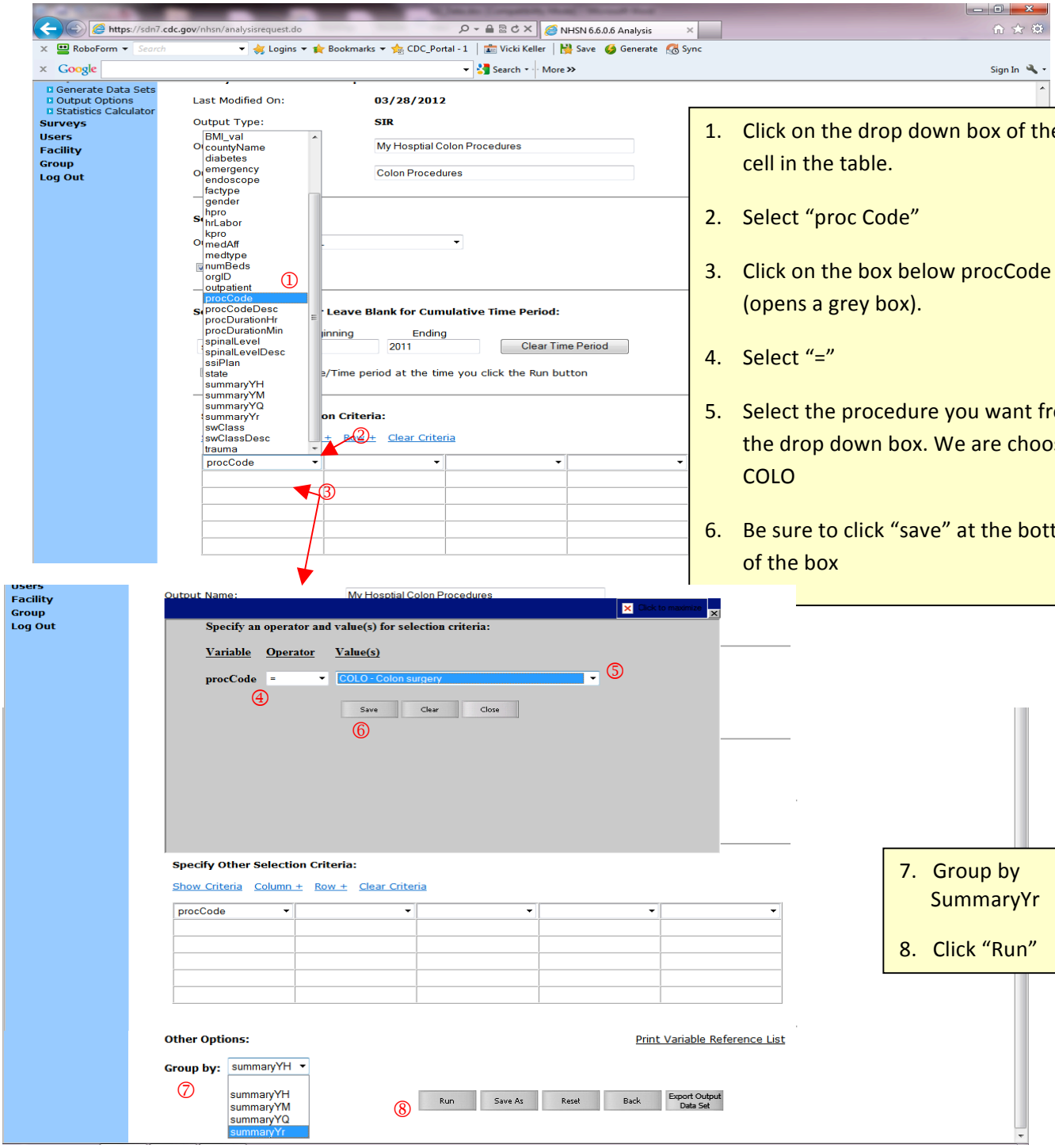
7. Next, we are going to run a report to analyze SSI data for just one procedure. REPEAT step one (as below).



8. When the Analysis SIR screen appears, name your report, leave in HTML, use variable labels, enter the date variable "summaryYR," and beginning and ending date "2011."



10. In the Selection Criteria table, click on the drop down box of the first cell. Select “procCode” (procedure code). When procCode appears in the table, click on a cell directly below. When the gray box appears, leave the operator for the variable procCode as = (equals). From the values drop down, select a procedure that you want to analyze. In this example, we selected “COLO”(colon procedures).

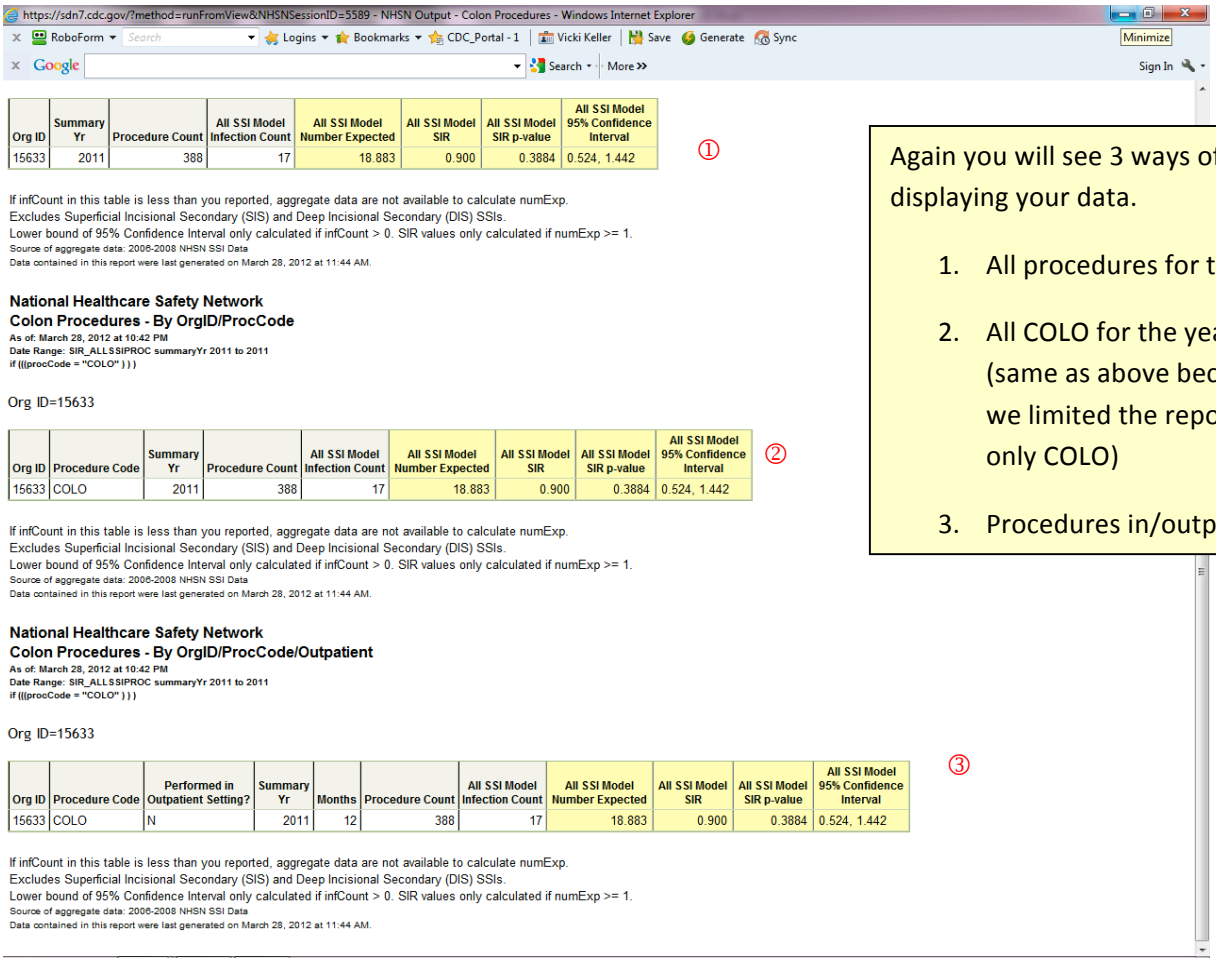


1. Click on the drop down box of the 1st cell in the table.
2. Select “proc Code”
3. Click on the box below procCode (opens a grey box).
4. Select “=”
5. Select the procedure you want from the drop down box. We are choosing COLO
6. Be sure to click “save” at the bottom of the box

7. Group by SummaryYr
8. Click “Run”

In the lower portion of the screen, be sure to Group by “SummaryYr.” Now click “Run” to see your report.

11. The report will include 3 data tables: All procedures by year, by procedure code, and by in/outpatient.



Org ID	Summary Yr	Procedure Count	All SSI Model Infection Count	All SSI Model Number Expected	All SSI Model SIR	All SSI Model SIR p-value	All SSI Model 95% Confidence Interval
15633	2011	388	17	18.883	0.900	0.3884	0.524, 1.442

①

If infCount in this table is less than you reported, aggregate data are not available to calculate numExp.
Excludes Superficial Incisional Secondary (SIS) and Deep Incisional Secondary (DIS) SSIs.
Lower bound of 95% Confidence Interval only calculated if infCount > 0. SIR values only calculated if numExp >= 1.
Source of aggregate data: 2006-2008 NHSN SSI Data
Data contained in this report were last generated on March 28, 2012 at 11:44 AM.

National Healthcare Safety Network
Colon Procedures - By OrgID/ProcCode
As of: March 28, 2012 at 10:42 PM
Date Range: SIR_ALLSSIPROC summaryYr 2011 to 2011
if (((procCode = "COLO")))

Org ID=15633

Org ID	Procedure Code	Summary Yr	Procedure Count	All SSI Model Infection Count	All SSI Model Number Expected	All SSI Model SIR	All SSI Model SIR p-value	All SSI Model 95% Confidence Interval
15633	COLO	2011	388	17	18.883	0.900	0.3884	0.524, 1.442

②

If infCount in this table is less than you reported, aggregate data are not available to calculate numExp.
Excludes Superficial Incisional Secondary (SIS) and Deep Incisional Secondary (DIS) SSIs.
Lower bound of 95% Confidence Interval only calculated if infCount > 0. SIR values only calculated if numExp >= 1.
Source of aggregate data: 2006-2008 NHSN SSI Data
Data contained in this report were last generated on March 28, 2012 at 11:44 AM.

National Healthcare Safety Network
Colon Procedures - By OrgID/ProcCode/Outpatient
As of: March 28, 2012 at 10:42 PM
Date Range: SIR_ALLSSIPROC summaryYr 2011 to 2011
if (((procCode = "COLO")))

Org ID=15633

Org ID	Procedure Code	Performed in Outpatient Setting?	Summary Yr	Months	Procedure Count	All SSI Model Infection Count	All SSI Model Number Expected	All SSI Model SIR	All SSI Model SIR p-value	All SSI Model 95% Confidence Interval
15633	COLO	N	2011	12	388	17	18.883	0.900	0.3884	0.524, 1.442

③

If infCount in this table is less than you reported, aggregate data are not available to calculate numExp.
Excludes Superficial Incisional Secondary (SIS) and Deep Incisional Secondary (DIS) SSIs.
Lower bound of 95% Confidence Interval only calculated if infCount > 0. SIR values only calculated if numExp >= 1.
Source of aggregate data: 2006-2008 NHSN SSI Data
Data contained in this report were last generated on March 28, 2012 at 11:44 AM.

Again you will see 3 ways of displaying your data.

1. All procedures for the year
2. All COLO for the year (same as above because we limited the report to only COLO)
3. Procedures in/outpatient

12. For this example, we will focus on the middle table to analyze our COLO data. In our example, there were 388 COLO performed and 17 SSI reported. The number of SSI following colon procedures in our hospital is below the NHSN expected number of 18.883. Our colon SIR is 0.90, which is below 1.0 , meaning 10% less SSI were observed in our data than expected. However, the confidence interval overlaps 1.0 (0.524 – 1.1442), so our SIR is not significantly different than expected.

Org ID	Procedure Code	Summary Yr	Procedure Count	All SSI Model Infection Count	All SSI Model Number Expected	All SSI Model SIR	All SSI Model SIR p-value	All SSI Model 95% Confidence Interval
15633	COLO	2011	388	17	18.883	0.900	0.3884	0.524, 1.442

If infCount in this table is less than you reported, aggregate data are not available to calculate numExp.
Excludes Superficial Incisional Secondary (SIS) and Deep Incisional Secondary (DIS) SSIs.
Lower bound of 95% Confidence Interval only calculated if infCount > 0. SIR values only calculated if numExp >= 1.
Source of aggregate data: 2006-2008 NHSN SSI Data
Data contained in this report were last generated on March 28, 2012 at 11:44 AM.

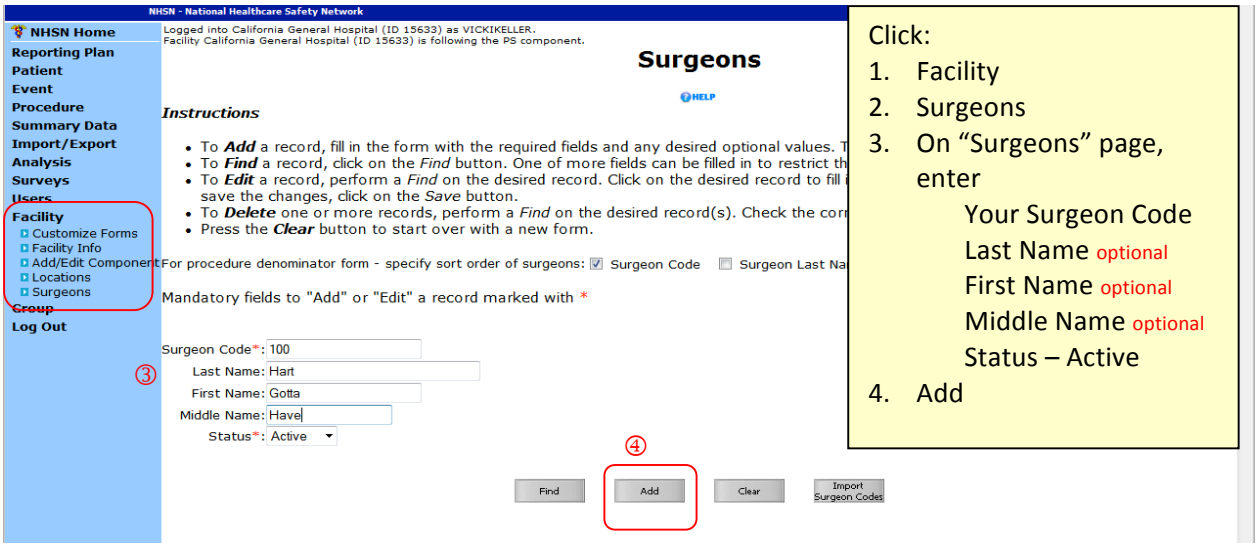
IMPORTANT! WHEN REVIEWING AN SSI SIR FOR STATISTICAL SIGNIFICANCE, LOOK FIRST AT THE **CONFIDENCE INTERVAL (CI)**. If CI overlaps 1.0, the SIR is **not** significantly different than expected. CIs are exact; p-values are estimates.

In our previous example, we may be content that our SSIs are below the number expected. However, we understand we cannot say the difference is significant. So what else might we learn from these COLO data? Can we look for trends in 2011, such as who performed the COLO procedures in our hospital and which procedures resulted in SSI? To perform this level of analysis, surgeon codes must be entered into NHSN. This can be done either manually or by CSV upload.

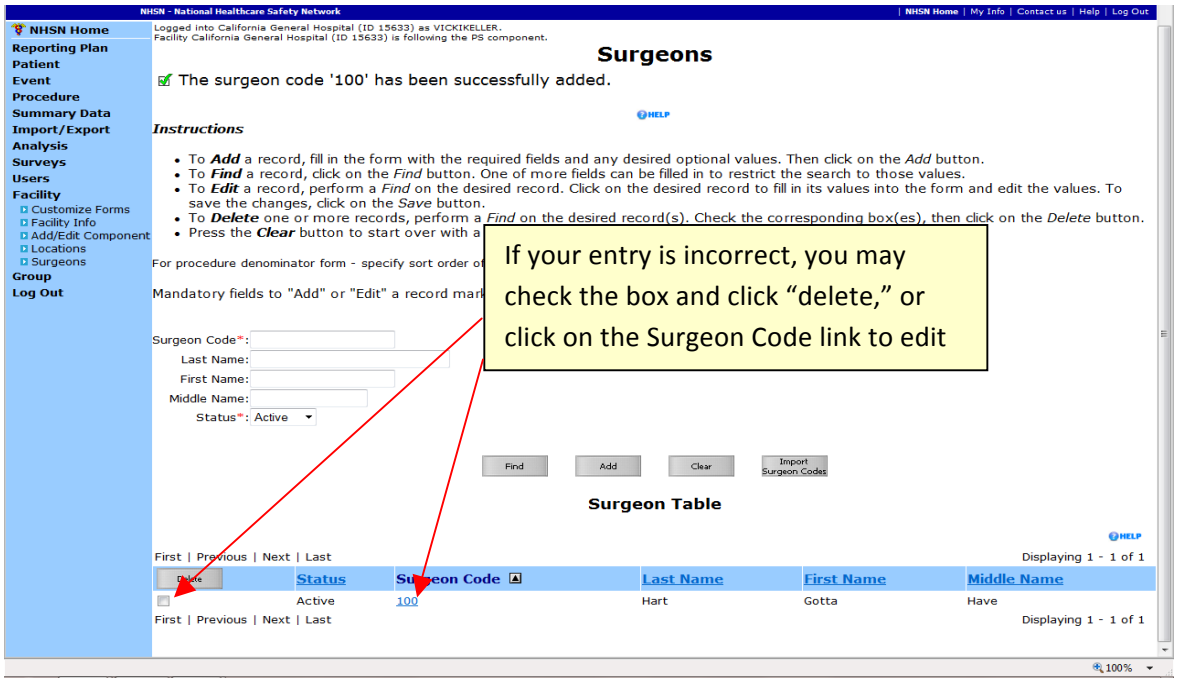
Entering Surgeon Codes Needed to Produce Surgeon-Specific SIRs

The following is a demonstration of how to enter your Surgeon Codes into NHSN. Note, this is **not** required under California reporting mandates. It should be noted that feedback of surgeon-specific SSI data has been demonstrated to decrease infections; it is a CDC/HICPAC Category 1B recommendation.

1. On the left blue navigation bar click: Facility→ Surgeons. On Surgeons page, enter each surgeon's information. The surgeon code is whatever number your hospital identifies with each surgeon. Check with Medical Records, OR or Medical Staff, or Perioperative Services for surgeon codes already in use.

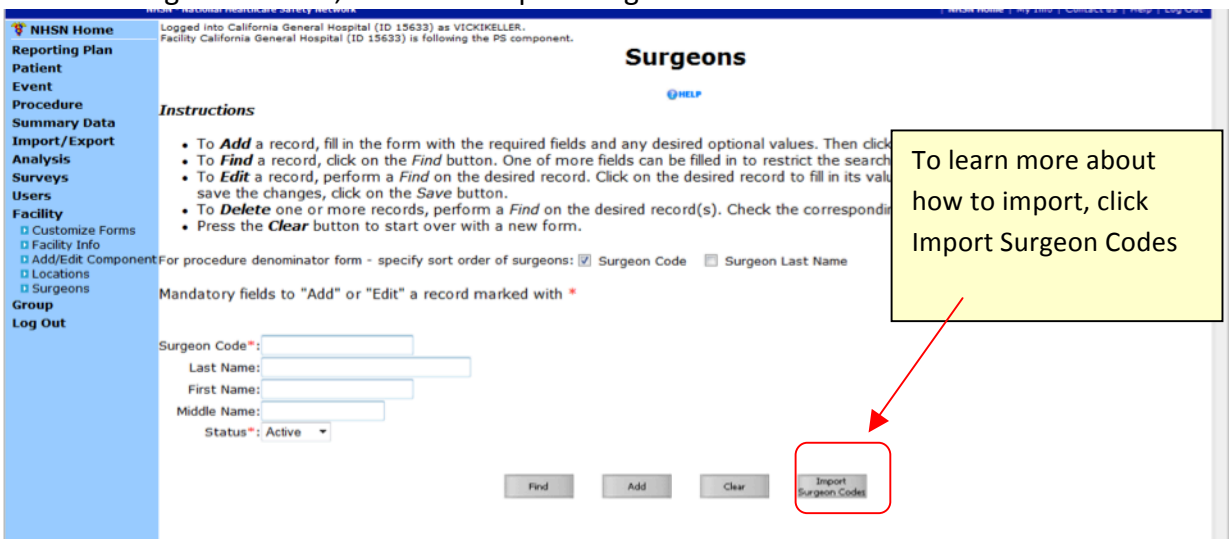


2. After you click add, the surgeon record will appear at the bottom of the screen.

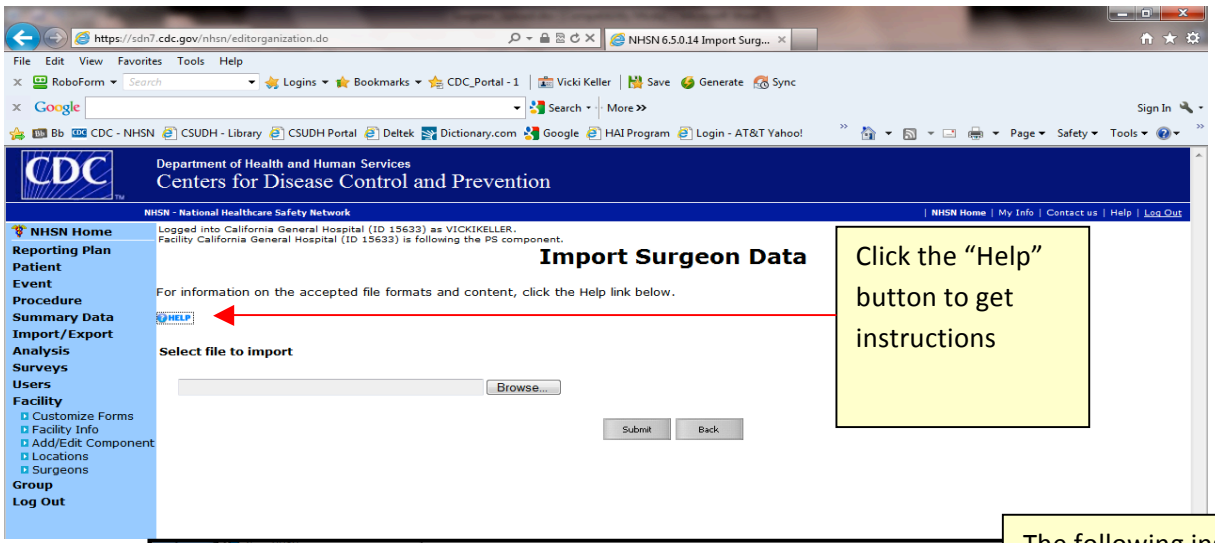


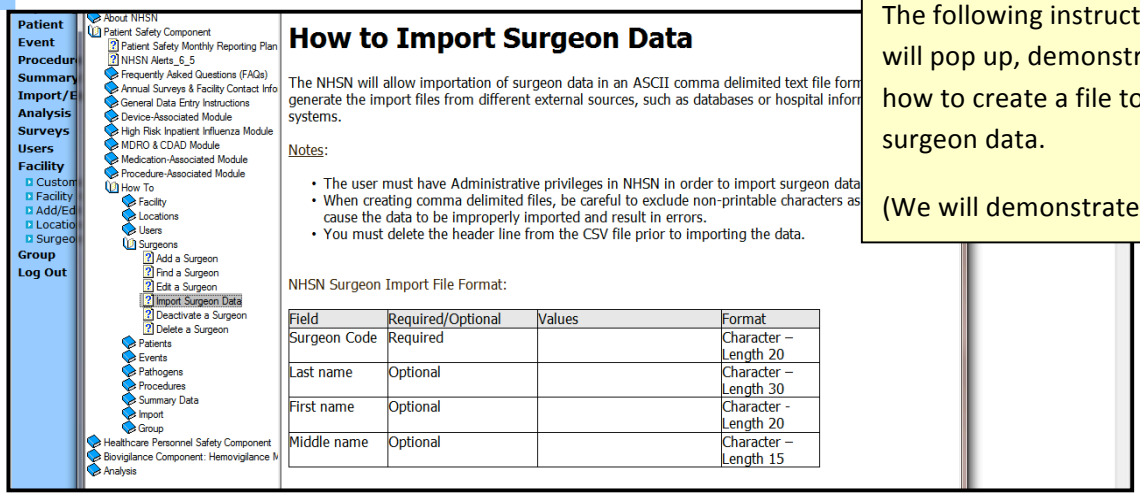
Manual entry could be a long process if you have more than a few surgeons. A faster way is to create a file with all your surgeon codes that can be uploaded at one time.

3. On the Surgeons screen, click the "Import Surgeon Codes" button for further instructions.

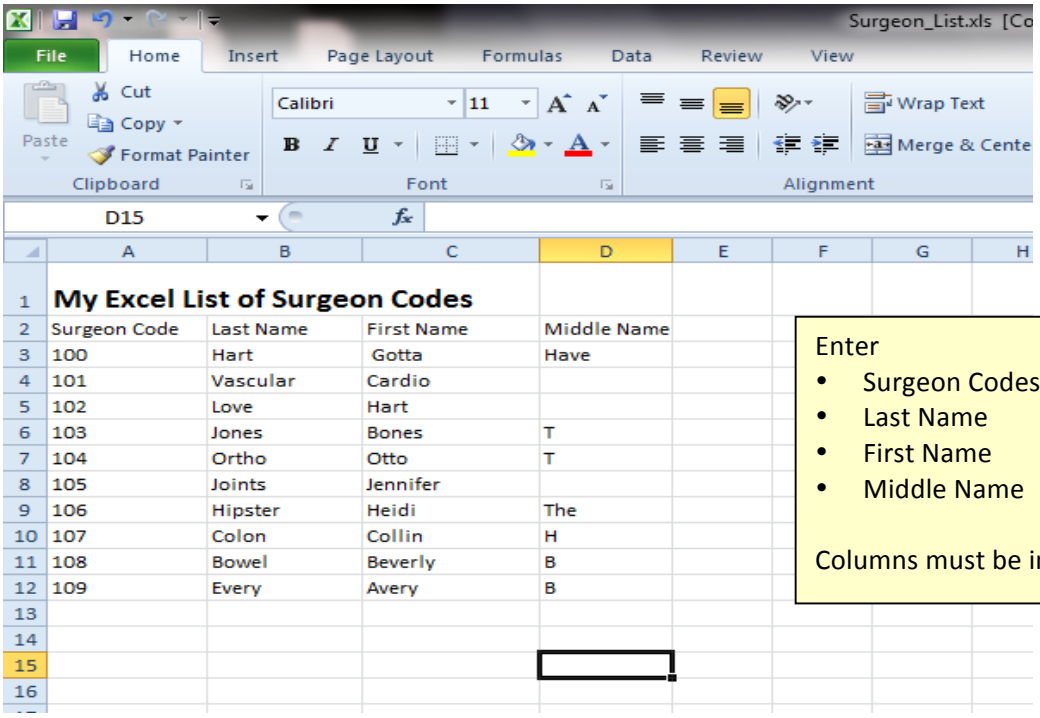


4. The Import Surgeon Data screen will appear. Use the HELP! Button for further instructions.





5. Leave NHSN and open Microsoft Excel. Create a worksheet with the columns and rows exactly as shown in the example below.

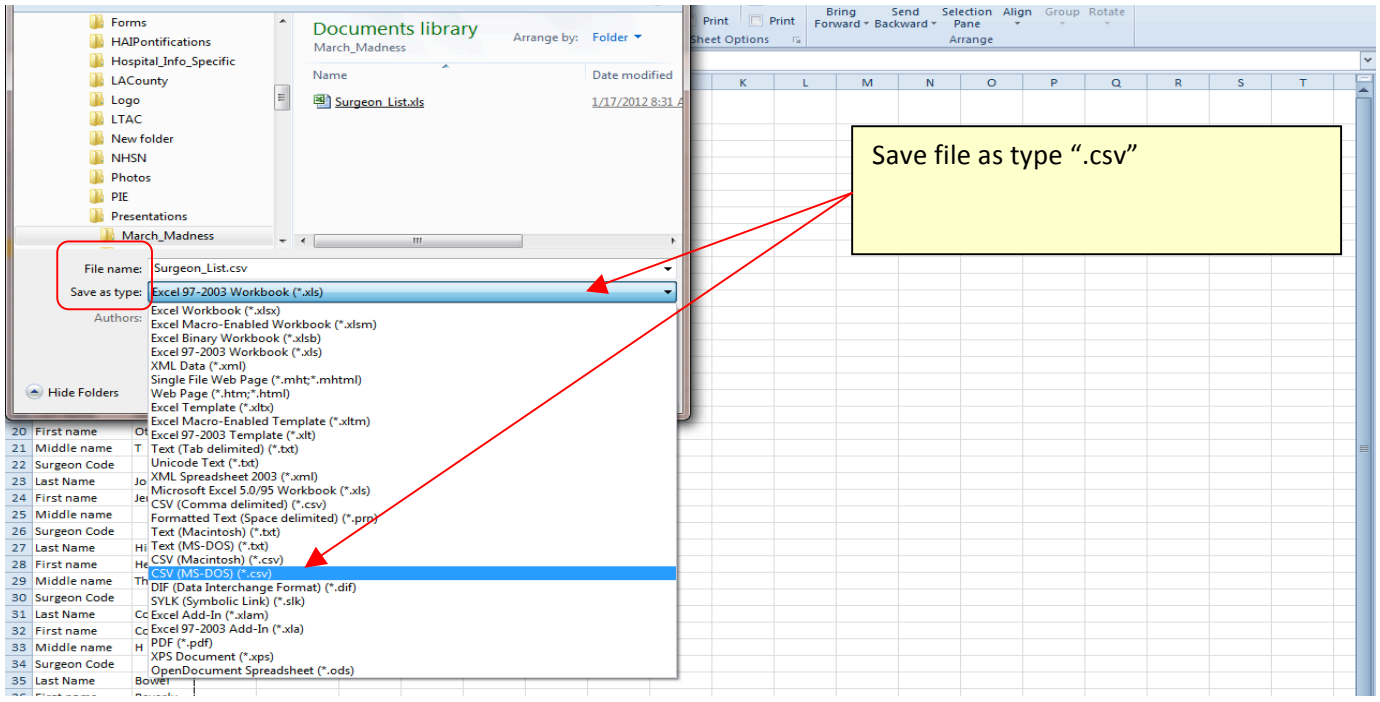


	A	B	C	D
1	**My Excel List of Surgeon Codes**			
2	Surgeon Code	Last Name	First Name	Middle Name
3	100	Hart	Gotta	Have
4	101	Vascular	Cardio	
5	102	Love	Hart	
6	103	Jones	Bones	T
7	104	Ortho	Otto	T
8	105	Joints	Jennifer	
9	106	Hipster	Heidi	The
10	107	Colon	Collin	H
11	108	Bowel	Beverly	B
12	109	Every	Avery	B

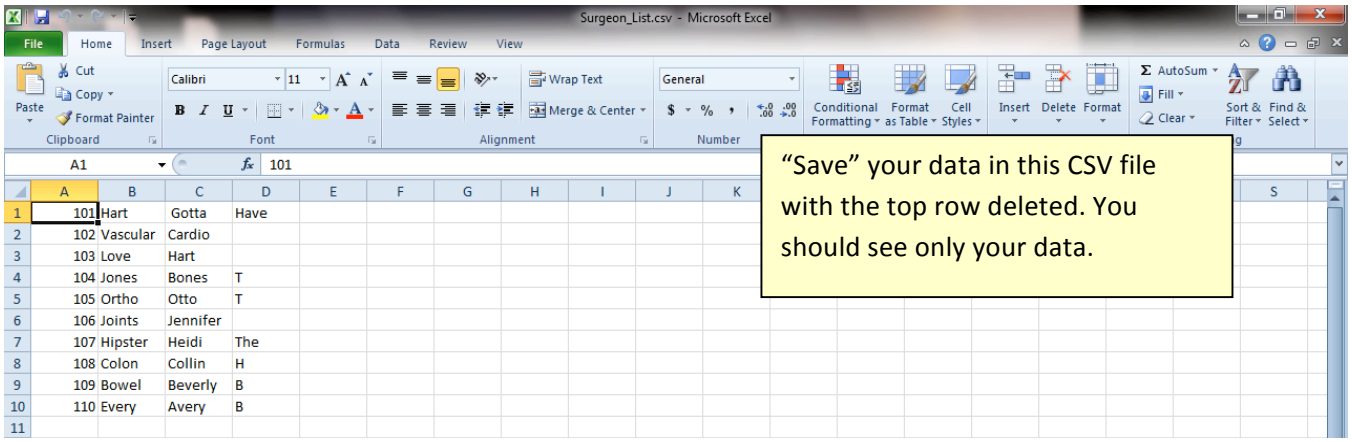
Enter
- Surgeon Codes
- Last Name
- First Name
- Middle Name

Columns must be in this exact order

6. "Save as" with a File name of your choice (e.g. Surgeon_List) and Type CSV ("*.csv") as in the illustration below.

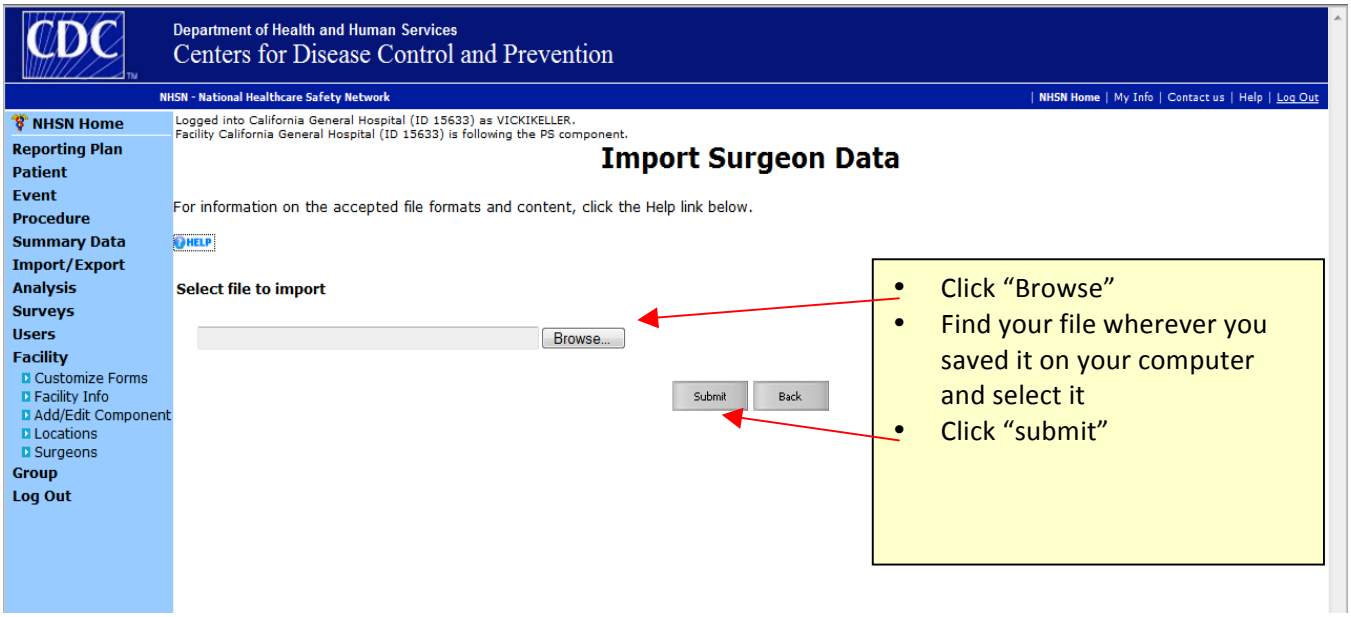


7. In the CSV file, delete the top row with all the labels or column headings. Only your data remains. Save again.

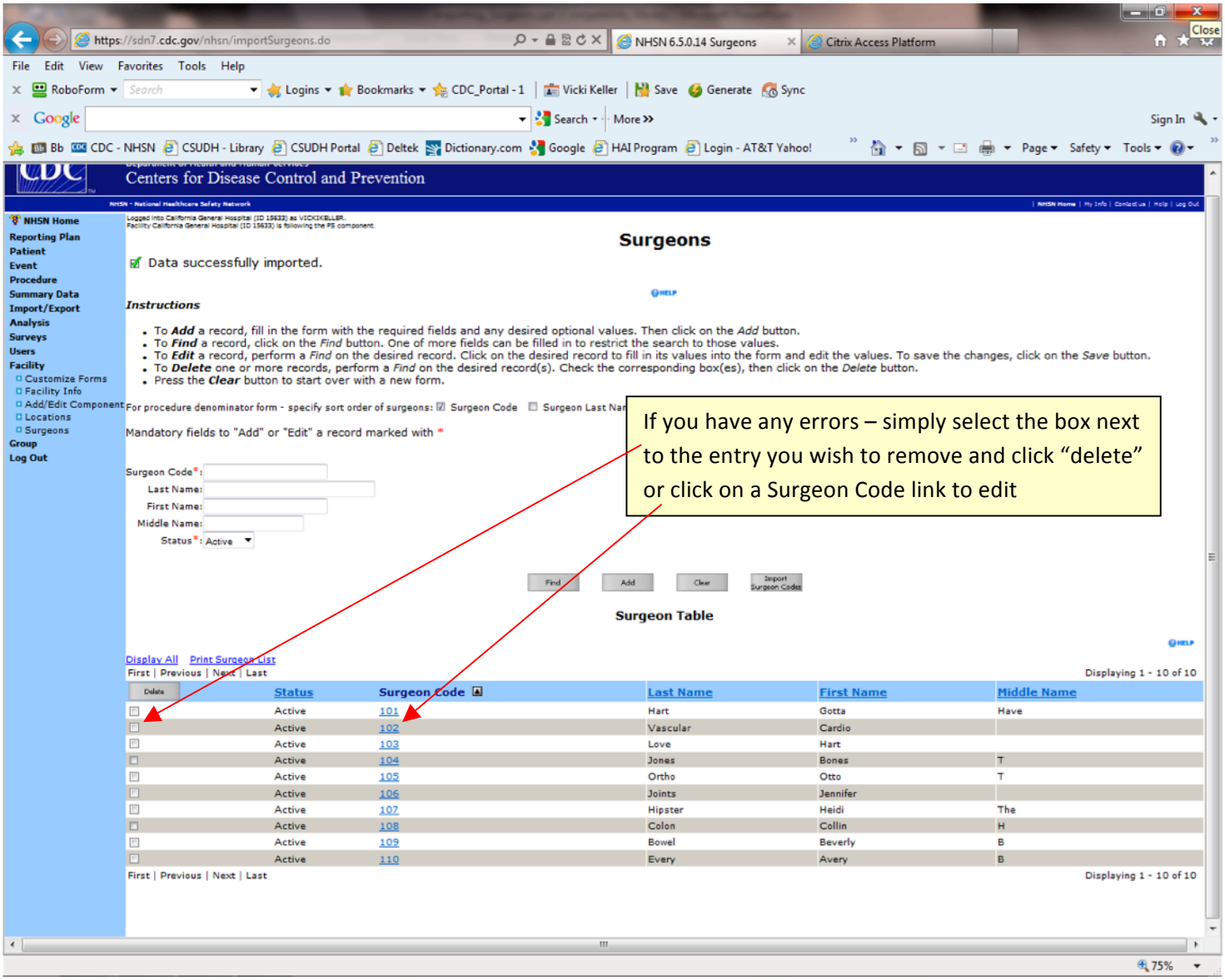


	A	B	C	D
1	101	Hart	Gotta	Have
2	102	Vascular	Cardio	
3	103	Love	Hart	
4	104	Jones	Bones	T
5	105	Ortho	Otto	T
6	106	Joints	Jennifer	
7	107	Hipster	Heidi	The
8	108	Colon	Collin	H
9	109	Bowel	Beverly	B
10	110	Every	Avery	B

8. Return to your NHSN Page for Surgeon Import as in step 1 of this section. The following screen will appear. Click on Browse to find the CSV file you saved for import



9. The Surgeons screen will appear with message “Data successfully imported,” and at the bottom, a Surgeon Table listing your newly imported surgeon codes.



Using the SIR Output Option to Review SSI Data by Surgeon Code

When you have entered your surgeon codes in NHSN, you may then begin to include in each Procedure record which surgeon performed the procedure. Analysis of SSI data can now include surgeon-specific results.

1. From the NHSN blue navigation bar, click Analysis →Output Options→ Procedure-Associated Module→ SSI→ CDC Defined Output→ SIR – SSI Data by Surgeon → Modify.
2. Modify by naming your report as you wish. Use Format HTML. Use variable labels. Select date as SummaryYr, 2011.
3. Select criteria for variable ProcCode and select COLO (or the procedure you want) as you did earlier.
4. Remember to select Group by SummaryYr. Click "Run"

In our example, a data table is produced that shows 3 surgeons and each of his/her number of procedures and SSI during 2011.

orgid	surgeoncode	summaryYr	procCount	infCountAll	numExpAll	SIRAll	SIRAll_pval	SIRAll95CI
15633	108	2011	113	1	5.522	0.181	0.0261	0.005, 1.009
15633	109	2011	158	16	7.719	2.073	0.0061	1.184, 3.366
15633	110	2011	117	0	5.643	0.000	0.0035	, 0.654

Note: NHSN does not show a lower bound of the CI when there are zero infections

Surgeon 108
113 procedures
1 infection reported
5.5 infections expected
SIR 0.18 certainly below 1.0
- CI overlaps 1.0 (barely!) so cannot say difference is significant than expected
- Note p-value <0.05 but an estimate

Surgeon 109
158 procedures
16 infections reported
7.7 infections expected
SIR 2.07
- CI does not overlap 1.0; difference is significant
- Can say SIR is 200% higher than expected

Surgeon 110
117 procedures
0 infections
5.6 infections expected
SIR 0
- CI does not overlap 1.0; difference is significant
- Can say SIR is 35% lower than expected

This demonstrates how each surgeon's SIR can be evaluated separately. In this example, when the total numbers of procedures and SSI are broken down by surgeon code, its easy to see where most of the infections occurred.

Now complete the surveillance loop! Feedback these data to each surgeon by showing how he/she compares to the group. This can be done by comparing a single surgeon's SIR to the overall SIR for a specific procedure. Statistical significance of the differences can be calculated using the NHSN Statistics Calculator. When presenting the data, its important to describe the SIR risk adjustment, and include a reminder that SIR adjusts for patient risk, so differences are not likely due to "sicker" surgical patients.

There are many other ways you can use your SSI data for prevention. For surgical groups or surgeons with SIRs >1.0:
- Assess adherence to SCIP measures. (You may also wish to review SCIP adherence for every SSI).
- Work with staff to perform observational studies in the OR to measure adherence to recommended surgical practices (e.g. CDC/HICPAC, AORN, ACS).
- Ensure there is a culture of safety in your OR where staff can speak up when breeches are suspected.

Make your SSI data work for you!